UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/767,732 | 01/28/2004 | David Champion | 200300734-1 | 6089 |

22879 7590 08/24/2007

HEWLETT PACKARD COMPANY
P O BOX 272400, 3404 E. HARMONY ROAD
INTELLECTUAL PROPERTY ADMINISTRATION
FORT COLLINS, CO 80527-2400

| EXAMINER | |
|---|---|
| WALFORD, NATALIE K | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2879 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 08/24/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/767,732 | CHAMPION ET AL. | |
| | Examiner | Art Unit | |
| | Natalie K. Walford | 2879 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *14 May 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-66* is/are pending in the application.

4a) Of the above claim(s) *2,11-25,37-39, 41-43 and 51-66* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 3-10, 26-40, 44-50* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

In view of the appeal brief filed on March 9, 2007, PROSECUTION IS HEREBY REOPENED. A new ground of rejection is set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:

NIMESHKUMAR D. PATEL
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

### *Response to Amendment*

The Remarks, filed on May 14, 2007, has been entered and acknowledged by the Examiner. Claims 1-66 are pending in the instant application.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3-5, 8, 29-32, 36, 40, 44-48, and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Enokido et al. (US PUB 2004/0255841) in view of Saha et al. (US 5,268,249).

Regarding claim 1, Enokido discloses a method for forming a photonic-crystal filament, the method comprising the steps of:

a) mixing a slurry comprising particles of substantially uniform size and a precursor material for a desired metal (paragraphs 39-49 and FIG. 7, items 41a, 42a, and 43a);

b) putting the slurry through an orifice while forcing the particles and precursor material into a combination having a desired crystallographic (i.e. a three-dimensional periodic structure, paragraph 43) configuration (FIG. 7, item 46a and paragraphs 41-49);

c) drying the combination having a desired crystallographic configuration (paragraph 47) emerging from the orifice (paragraphs 41-50); and

d) sintering the precursor material, whereby a photonic-crystal filament is formed (paragraph 52), but does not expressly disclose that the slurry is forced through the orifice, as claimed by Applicant. Saha is cited to show that slurry that is forced through an orifice (column 6, line 29 thru column 7, line 28). Saha teaches that slurry may have a desired particle size when forced through the orifice (column 6, lines 53-58).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Enokido's invention to include the slurry forced through the orifice as suggested by Saha for having a desired particle configuration and size.

Regarding claim 3, the combined reference of Enokido and Saha disclose the method of claim 1, but does not expressly disclose the further step of: e) compressing the slurry, as claimed by Applicant. Enokido does disclose that the slurry is stirred and then fed through the print heads (paragraph 96). Therefore, for the slurry to fit through the print heads, it would have to be compressed or reduced, as claimed by Applicant.

Regarding claim 4, the combined reference of Enokido and Saha disclose the method of claim 1, further comprising the step of: f) heating the dried combination to remove the particles (Enokido; paragraphs 41-49).

Regarding claim 5, the combined reference of Enokido and Saha disclose the method of claim 4, wherein the heating step f) and the sintering step d) are performed simultaneously (Enokido; paragraph 52).

Regarding claim 8, the combined reference of Enokido and Saha disclose the method of claim 1, but do not expressly disclose the further step of: g) reducing the precursor material to metallic form, as claimed by Applicant. Enokido does disclose that the slurry is of metallic form (paragraph 39); hence, it would have been obvious to one having ordinary skill in the art at the time the invention was made that the precursor material would be of metallic form, since the slurry is as well.

Regarding claim 31, the combined reference of Enokido and Saha disclose the method of claim 1 wherein the particles comprise substantially spherical particles (Enokido; FIG. 8, item 61).

Regarding claim 29, the combined reference of Enokido and Saha disclose the method of claim 1, but do not expressly disclose that the precursor material comprises an oxide of tungsten, as claimed by Applicant. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the precursor material comprise an oxide of tungsten, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the purpose of using it for the precursor material.

Regarding claim 30, the combined reference of Enokido and Saha disclose the method of claim 1, but do not expressly disclose that the precursor material comprises peroxopolytungstic acid, as claimed by Applicant. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the precursor material comprise peroxopolytungstic acid, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the purpose of using it for the precursor material.

Regarding claim 32, the combined reference of Enokido and Saha disclose the method of claim 1, but do not expressly disclose that the particles comprise non-spherical particles, as claimed by Applicant. It would have been obvious to one having ordinary skill in the art to change the shape of the particle to be non-spherical, since such a modification would have involved a mere change is the shape of the particle. A change in shape is generally recognized as being with the level of ordinary skill in the art.

Regarding claim 36, the combined reference of Enokido and Saha disclose the method of claim 1, wherein the photonic-crystal filament has a desired photonic band-gap, and the substantially uniform size of the particles is adapted to provide the desired photonic band-gap (Enokido; paragraph 71).

Regarding claim 40, the combined reference of Enokido and Saha disclose the method of claim 1, wherein the photonic-crystal filament has a longitudinal axis and a selected crystallographic axis of the desired crystallographic configuration is aligned parallel to the longitudinal axis of the photonic-crystal filament (Enokido; FIG. 8, item 61).

Regarding claim 44, Enokido discloses a method of cladding a metal filament, the method comprising the steps of:

a) providing a metal filament (paragraph 39);

b) mixing a slurry comprising particles of substantially uniform size and a precursor material for a desired metal (paragraphs 40-49 and FIG. 7, items 41a, 42a, and 43a);

c) putting the metal filament and the slurry through an orifice while forcing the particles and precursor material into a combination having a desired crystal configuration surrounding the metal filament (FIG.7, item 46a and paragraphs 41-49);

d) drying the combination having the desired crystallographic configuration (paragraph 47) emerging from the orifice (paragraphs 41-50);

e) sintering the precursor material (paragraph 52), but does not expressly disclose that the slurry is forced through the orifice, compressing the precursor material within a sheath, while drawing the filament and sheath through a series of two or more successively smaller dies, whereby the filament is clad with a photonic crystal, as claimed by Applicant. Enokido does disclose that the

slurry is stirred in a sheath (i.e. tank) and then fed through the print heads such that the filament and photonic crystal are mixed (paragraph 96). Therefore, for the slurry to fit through the print heads, it would have to be compressed or reduced, as claimed by Applicant. Saha is cited to show that slurry that is forced through an orifice (column 6, line 29 thru column 7, line 28). Saha teaches that slurry may have a desired particle size when forced through the orifice (column 6, lines 53-58).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Enokido's invention to include the slurry forced through the orifice as suggested by Saha for having a desired particle configuration and size.

Regarding claim 45, it has been held that to be entitled to weight in method claims, the recited structure limitations therein must affect the method in manipulative sense, and not to amount to the mere claiming of a particular structure, such as the clad filament.

Regarding claim 46, the combined reference of Enokido and Saha disclose the method of claim 45, but do not expressly disclose the further step of: g) compressing the slurry, as claimed by Applicant. Enokido does disclose that the slurry is stirred and then fed through the print heads (paragraph 96). Therefore, for the slurry to fit through the print heads, it would have to be compressed or reduced as claimed by Applicant.

Regarding claim 47, the combined reference of Enokido and Saha disclose the method of claim 45, further comprising the step of: h) heating the dried combination to remove the particles (Enokido; paragraphs 41-49).

Regarding claim 48, the combined reference of Enokido and Saha disclose the method of claim 48, wherein the heating step h) and the sintering step e) are performed simultaneously (Enokido; paragraph 52).

Regarding claim 50, the combined reference of Enokido and Saha disclose the method of claim 45, but does not expressly disclose that the precursor material comprises a metal oxide, as claimed by Applicant. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the precursor material comprise a metal oxide, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the purpose of using it for the precursor material.

Claims 6-7, 26-28, 33-35, and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Enokido et al. (US PUB 2004/0255841) in view of Saha et al. (US 5,268,249) in further view of Fleming et al. (US 6,768,256).

Regarding claim 6, the combined reference of Enokido and Saha disclose the method of claim 1, but do not expressly disclose that the particles comprise an inert material, as claimed by Applicant. Fleming is cited to show a photonic crystal with particles comprising silicone, an inert material (column 5, lines 53-56). Fleming teaches that using certain photonic crystal structures and materials can help to modify spectral properties of a light source (column 2, lines 32-33).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined reference of Enokido and Saha to include the

particles comprising an inert material as suggested by Fleming for helping the spectral properties of a light source using the photonic crystal.

Regarding claim 7, the combined reference of Enokido and Saha disclose the method of claim 1, but do not expressly disclose that the precursor material comprises a metal oxide, as claimed by Applicant. Fleming is cited to show a photonic crystal using metal oxide (column 6, lines 12-24). Fleming teaches that the use of a metal oxide such as tungsten can provide large dielectric contrast and moderate imaginary dielectric contrast preferred for enhanced emission (column 6, lines 15-18).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined reference of Enokido and Saha to include the precursor material comprising a metal oxide as suggested by Fleming for enhancing emission.

Regarding claim 26, the combined reference of Enokido and Saha disclose the method of claim 1, but do not expressly disclose that the desired metal is a refractory metal, as claimed by Applicant. Fleming is cited to show a photonic crystal using a refractory metal (column 6, lines 12-24). Fleming teaches that the use of a refractory metal such as tungsten can provide large dielectric contrast and moderate imaginary dielectric contrast preferred for enhanced emission (column 6, lines 15-18).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined reference of Enokido and Saha to include the desired metal is a refractory metal as suggested by Fleming for enhancing emission.

Regarding claim 27, the combined reference of Enokido, Saha, and Fleming disclose the method of claim 27, wherein the refractory metal is selected from the list consisting of tungsten, platinum, tantalum, molybdenum, and alloys thereof (Fleming; column 6, lines 15-18).

Regarding claim 28, the combined reference of Enokido and Saha disclose the method of claim 1, but do not expressly disclose that the desired metal is tungsten or an alloy thereof, as claimed by Applicant. Fleming is cited to show a photonic crystal using tungsten (column 6, lines 12-24). Fleming teaches that the use of a metal such as tungsten can provide large dielectric contrast and moderate imaginary dielectric contrast preferred for enhanced emission (column 6, lines 15-18).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined reference of Enokido and Saha to include the desired metal is tungsten or an alloy thereof as suggested by Fleming for enhancing emission.

Regarding claim 33, the combined reference of Enokido and Saha disclose the method of claim 1, but do not expressly disclose that the particles comprise polymer particles, as claimed by Applicant. Fleming is cited to show a photonic crystal with particles comprising silicone, a polymer (column 5, lines 53-56). Fleming teaches that using certain photonic crystal structures and materials can help to modify spectral properties of a light source (column 2, lines 32-33).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined reference of Enokido and Saha to include the particles comprising polymer materials as suggested by Fleming for helping the spectral properties of a light source using the photonic crystal.

Regarding claim 34, the combined reference of Enokido and Saha disclose the method of claim 1 wherein the particles are nanospheres (Enokido; FIG. 8, item 61), but do not expressly disclose that the particles are polymer nanospheres, as claimed by Applicant. Fleming is cited to show a photonic crystal with particles comprising silicone, a polymer (column 5, lines 53-56). Fleming teaches that using certain photonic crystal structures and materials can help to modify spectral properties of a light source (column 2, lines 32-33).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined reference of Enokido and Saha to include the particles comprising polymer materials as suggested by Fleming for helping the spectral properties of a light source using the photonic crystal.

Regarding claim 35, the combined reference of Enokido, Saha, and Fleming disclose the method of claim 34, but do not expressly disclose that the polymer particles comprise a material selected from the list consisting of polystyrene, polyethylene, polymethylmethacrylate (PMMA), latex, and combinations thereof, as claimed by Applicant. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the precursor material comprise a material selected from the list consisting of polystyrene, polyethylene, polymethylmethacrylate (PMMA), latex, and combinations thereof, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the purpose of using it for the polymer particles.

Regarding claim 49, the combined reference of Enokido and Saha disclose the method of claim 45, but do not expressly disclose that the particles comprise an inert material, as claimed by Applicant. Fleming is cited to show a photonic crystal with particles comprising silicone, an

inert material (column 5, lines 53-56). Fleming teaches that using certain photonic crystal structures and materials can help to modify spectral properties of a light source (column 2, lines 32-33).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined reference of Enokido and Saha to include the particles comprising an inert material as suggested by Fleming for helping the spectral properties of a light source using the photonic crystal.

Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Enokido et al. (US PUB 2004/0255841) in view of Saha et al. (US 5,268,249) in view of Kodas et al. (US PUB 2003/0175411).

Regarding claim 9, the combined reference of Enokido and Saha disclose the method of claim 8, wherein step g) of reducing the precursor material comprises heating the precursor material (paragraphs 41-49), but do not expressly disclose that the heating is done in a reducing environment, as claimed by Applicant. Kodas is cited to show a precursor composition that is heated under a reducing environment (paragraph 495). Kodas teaches that during this process, certain reaction conditions help for the formation of the metal at a desired temperature (paragraph 133).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined reference of Enokido and Saha to include the heating done in a reducing environment for helping the formation of the metal.

Regarding claim 10, the combined reference of Enokido, Saha and Kodas disclose the method of claim 9, wherein the reducing environment comprises a gas selected from the list consisting of hydrogen, forming gas, a carbide gas, acetylene, and mixtures thereof (Kodas; paragraph 495).

### *Response to Arguments*

Applicant's arguments with respect to claims 1-66 have been considered but are moot in view of the new ground(s) of rejection.

### *Contact Information*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Natalie K. Walford whose telephone number is (571)-272-6012. The examiner can normally be reached on Monday-Friday, 8 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on (571)-272-2457. The fax phone number for the organization where this application or proceeding is assigned is (571)-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would

like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

nkw

Nathan Wait
8/20/07

S. Roy
8/20/07
Sikha Roy
AU 2879